

or 68.42 per cent. Eight storm signals were ordered; number justified, two, or 25.00 per cent. Fifty-five direction signals were ordered; justified, fifty, or 90.91 per cent.; of these, twenty-eight signals were ordered for easterly winds; justified, twenty-four, or 85.71 per cent.; twenty-seven signals were ordered for westerly winds; number justified, twenty-six, or 96.30 per cent., and five storms occurred for which no signals were ordered. No signals were ordered late, *i. e.*, after the verifying velocity had begun.

The following rules adopted for determining the justification or non-justification of signals are given:

The signals ordered will indicate the degree of the intensity of the storm and direction of the wind during the display. The degree of intensity will be indicated by two different signals, to be designated, respectively, the "cautionary signal" and the "storm signal," and the direction of the wind by four different signals, to be designated after the four quadrants, *viz.*, "northeast," "southeast," "northwest," and "southwest."

The following are the wind directions which should occur at any station to justify the display of a direction signal. For signals for an easterly quadrant, winds from any direction from northeast to south, both inclusive. For signals for a westerly quadrant, winds from any direction from north to southwest, both inclusive.

The justification of wind signals will be determined by districts, all signals (one or more) displayed in one district at the same time counting as one signal.

Percentages of justifications will be computed separately for each of the following classes of signals, *viz.*, cautionary signals; storm signals; signals for easterly winds; signals for westerly winds.

Cautionary and storm signals will be justified by the wind velocities occurring during the displays, according to the following rules:

A signal will be recorded as justified if the wind attain a justifying velocity at one or more stations in the district.

A direction signal will be recorded as justified if the direction indicated by the signal occurs, during the display, at one-half or more of the stations in the district.

The statement showing the percentages of signals justified, will also show the number of storms for which signals were not ordered and the number of signals ordered late.

A storm without signals will be recorded whenever a justifying velocity without signals is reported from two or more stations of the same or contiguous districts during a period of eight hours, or whenever said velocity, without signals, is reported from the same station once or more during each of two or more consecutive periods of eight hours.

When a signal is justified but the wind attains a justifying velocity before the signal is ordered, it will be recorded as late.

LOCAL VERIFICATIONS.

The following is from the report of the "Michigan State Weather Service" for October, 1887:

Weather and temperature signals are now displayed in one hundred and thirty-five towns in the state, and on the baggage-cars of twenty-five trains on seven principal railroads of the state.

The percentage of verification of weather signals for October is as follows (the verification is taken from reports of displaymen furnished this office monthly): temperature, 85.6 per cent.; weather, 85.2 per cent.; temperature and weather, 85.4 per cent.

The percentage of verification of weather predictions for October on the D., G. H., and M. R'y., is 87.3 for weather and 82.7 for temperature; on the C. & G. T. R'y., weather, 83.7, and temperature, 84.0; P. H. & N. R'y., weather, 86.8, and temperature, 83.7; M. C. R'y., for weather, 85.8, and for temperature, 84.0; G. R. & I. R'y., weather, 81.8, and temperature, 84.0; C. & W. M. R'y., weather, 83.0, and temperature, 82.7.

There was one cold-wave signal displayed on the 4th at 11 a. m., and lowered at 9 a. m. of the 5th. Four stations report the signal verified by a fall of 15° or more in the temperature.

The following is from the October, 1887, report of the "Minnesota Weather Service:"

Verifications of weather signals for Minnesota were 83 per cent. for weather and 74 per cent. for temperature.

The following is from the "Tennessee State Board of Health Bulletin" for October, 1887:

The percentage of verification of weather and temperature predictions, furnished daily from the Signal Office at Washington to the various stations in the state during the month, was for the state: weather, 86.3 per cent.; and temperature, 86.2 per cent.

ERRATA.

September, 1887, REVIEW, page 240, in the table of the extreme monthly ranges of barometer, Rio Grande City, Tex., should read Brownsville, Tex.

In the table of "Miscellaneous meteorological data," page 262, the mean reduced barometer at Eastport, Me., 29.92, should read 30.01.

On page 258, under the heading of "Drought," Rappahannock, Caroline Co., 30th, should read Rappahannock, Fauquier Co.

In the table of "Meteorological record of voluntary observers and Army post surgeons," on page 264, the monthly mean temperature at Cedar Rapids a, Iowa, 47.8, should read 63.2.

July, 1887, REVIEW, page 208, the departure from the normal precipitation, for the district of New England, -0.96, should read +0.96.

STATE WEATHER SERVICES.

The following extracts are republished from reports for October, 1887, of the directors of the various state weather services:

The "Alabama Weather Service," P. H. Mell, jr., of the Agricultural and Mechanical College, Auburn, director:

The first weeks of October were mild and pleasant weather, with but little rain in any part of the state. Heavy rains were produced on the 17th to 20th by the low pressure that prevailed at Mobile and along the Gulf during this period. Precipitations were quite frequent during the last two weeks of the month until the low pressure on the Gulf was forced out by the high pressure that swept across the country during the 25th, 26th, and 27th. This cyclonic disturbance was followed by a cold wave on the 29th and 30th of some severity. This cold wave produced a heavy frost throughout the state on the morning of the 31st. Ice was also formed at the same time. This was the first killing frost of the winter. Light frosts were reported on the 12th, but little damage was done. For the month of October the temperature was 5°.2 below the average, and the precipitation was 0.31 of an inch below the average.

Summary.

Temperature (in degrees Fahr.).—Monthly mean, 61°.9; highest monthly mean, 69°.3, at Pine Apple; lowest monthly mean, 46° .6, at Tuscumbia; maximum, 87° .2, at Mobile, on the 10th; minimum, 22°, at Gadsden, on the 31st; range for state, 65° .2; greatest monthly range, 61°, at Gadsden; least local monthly range, 42°, at Selma. Frosts, 12th to 15th, 22d and 31st.

Precipitation, including melted snow (in inches).—Average for the state, 2.85; greatest, 4.95, at Tuscumbia; least, 0.08, at Pine Apple.

Winds.—Prevailing direction, northeast.

The "Monthly Review of the Illinois Weather Service," Col. Charles F. Mills, director:

The temperature for the month was considerably below the normal in all parts of the state. The greatest departure was at Greenville, where it was 8° .8 below the normal of nine years. Other remarkable departures were at Golconda, 6° .4 below the normal of nine years; at Aurora, 6° .2 below the normal of nine years; at Sycamore, 6° .1 below the normal of seven years; at Springfield, 5° .9 below the normal of nine years, and at Chicago, where it was 6° .3 below the normal of sixteen years. In no part of the state did the temperature reach the normal for the month. The early part of the month was

warm for the season, but the latter was much colder than usual. The coldest day in the northern and central divisions was the 25th; the warmest for the state was the 7th. In the southern division, the coldest day was the 30th.

The average temperature for October was 50° .4, which is 8° .8 below the normal of the past thirteen years, and only once in that time has the October mean been lower, in 1875, when it was 49° .8, which was the coldest, while October, 1881, with a mean of 71° .2, was the warmest in the above period. The average temperature of the northern division was 46° .5; for the central, 51° .4, and for the southern, 53° .3. The highest mean temperature reported was 62° .3, at Benton, Franklin Co.; the lowest was 41° .3, at Prairieville, Lee Co. The highest temperature reported was 92°, at Oquawaka, Henderson Co., and the lowest, 12°, at Cedarville, Stephenson Co., giving an absolute range of 80°.

The remarkable drought of the season continued through the month unabated. In four places only in the state did it reach the normal, and, in most places, it was far below it. The 2d, 9th, 10th, and 23d were the days on which rain fell generally, especially in the northern and central divisions, the southern was far less fortunate all through the month, its deficiency being much greater than that of either of the other divisions. The northern division got most, the central next, and the southern least of all, the rainfall of the former being more than twice that of the latter. The greatest amount reported was 3.59 inches at Aurora, and the least was 0.30 of an inch at Jacksonville, Morgan Co. The average for the state was 1.49 inches, which was 2.04 inches below the normal of the last ten years.

The "Indiana Weather Service," Prof. H. A. Huston, of Purdue University, Lafayette, director:

The monthly mean barometric pressure over the state of Indiana during October was slightly above the normal pressure for a number of years. This was evidently caused not only because a greater number of high barometric areas in passing eastward brought their central pressure very near Indiana, but also because a smaller number of low barometric areas, when passing eastward, moved so far north or south from the state that only the isobars more distant from the centres of such low areas reached Indiana, or, only slight depressions or troughs, joining two low areas, in British America and over the Gulf of Mexico, respectively, affected the barometer slightly and for a short time only.

The mean temperature for October, 1887, was 4° 6 below the normal; the weather was uniformly cool, the temperature being each day below the normal, except during the 6th and 9th, when it was above. The total deficiency was nearly 15° during the month, and since January 1, 1887, 35°; having started with 117° in excess on September 30, the month ended with a deficiency of 35°. Hoar frost occurred frequently in nearly every part of the state.

The precipitation was considerably below the normal, more especially in the central and southern parts. The total deficiency during the month was 2.74 inches, and since January 1, 1887, 13.21 inches. So great a deficiency, extending over so many months preceding October, surpasses any former droughts on record. From every part of the state reports have been received as to great scarcity of water, and the evils consequent on such protracted drought are felt in many localities. Creeks and surface wells have become dry; wheat either has not come up at all or has turned yellow in many fields, and cattle are suffering for the want of sufficient water, as it has to be brought to many farms from great distances. The observer at Vevay reports that the Ohio River has been lower than noted for many years.

Summary.

Atmospheric pressure (in inches).—Monthly mean, 30.139; maximum observed, 30.789, at Mount Vernon, on the 25th; minimum, 29.650, at Worthington; range for state, 0.802; greatest local range, 0.979, at Lafayette; least local range, 0.580, at Rockville.

Temperature (in degrees Fahr.).—Monthly mean, 49.6; highest monthly mean, 55.9, at Mount Vernon; lowest monthly mean, 43.0, at Mauzy; maximum, 86.0, at Vevay and Logansport, on the 7th; minimum, 14.0, at Mauzy, on the 22d; range for state, 72.0; greatest local monthly range, 64.0, at Mauzy and Logansport; least local monthly range, 47.0, at Rockville.

Precipitation, including melted snow (in inches).—Average for the state, 1.06; greatest, 2.22, at Angola; least, 0.27, at Brookville.

Wind.—Prevailing direction, southwest.

The "Kansas Weather Service," Prof. J. T. Lovewell, Topeka, director:

The mean temperature for the month is 54° 6; the highest temperature, 96°, occurred in the central counties on the 5th and 6th; the lowest temperature, 10°, occurred in Gove and Logan counties on the 24th, making the range of temperature for the state 86°; the mean temperature has ranged below the normal over the state.

The average precipitation for the state is 1.40 inches; the greatest, 4.81, occurring at Rome, Sumner Co., while at Grinnell and Kanapolis no precipitation occurred. A peculiar feature is that the temperature and rainfall are both below the normal. Nearly all of the precipitation fell during the storm of the 7-9th.

The "Michigan Crop Report" (the state weather service is in charge of N. B. Conger, Sergeant, Signal Corps, at Lansing):

The meteorological features of the state are based upon reports received from sixty-one voluntary observers and eight of the United States Signal Service. Ten of these reports are for rainfall only.

The temperature is below the normal in all sections for October, and the precipitation is above the normal in the northern half of the state and below the normal in the southern half. Two severe storms passed over the state, accompanied by high winds which did considerable damage to shipping, and several terrible disasters are recorded of vessels going down, with the loss of many lives.

Temperature.—The mean temperature for the state, 44° 1, is 5° 5 below the normal. The temperature for the sections is below the normal from 5° 7 in the Upper Peninsula to 8° 0 in the northern section. The highest mean daily temperature, 64°, occurred on the 8th, and the lowest, 21°, on the 25th. The temperature reached the maximum on the 8th, and then fell slowly until the 18th, then a rise on the 15th, then the temperature fell steadily until the minimum was reached on the 25th, when it again rose to the normal on the 31st. The highest temperature for the month, 85°, occurred on the 8th, and the minimum, 4° 0, on the 30th. Frosts were general throughout the state after the 11th.

Precipitation (in inches).—The average monthly precipitation, 3.16, is 0.40 below the normal. The deficiency is greatest in the central counties, where it amounts to 1.03. The Upper Peninsula and northern counties show an excess of 0.37 in the former, and 0.22 in the latter. General rains fell on the 1st, 2d, 3d, 4th, 9th, 10th, 11th, 20th, 21st, 22d, and 23d, and local precipitation on the 6th, 7th, 8th, 12th, 13th, 16th, 17th, 27th, 28th, and 29th. The rain on the 9th, and the rain and snow which occurred on the 23d, were heavy, the amounts at many stations being over one inch.

The average number of rainy days for the Upper Peninsula was 14.8; northern counties, 12.4; central counties, 8.9; southern counties, 9.2; for the state, 10.5.

Hail was reported from eleven stations.

Snow was general on the 21st to 24th, but it melted rapidly, and but a trace is reported on the ground at the end of the month. The exceptions are Calumet, 0.2 inch; Marquette, 1.0 inch; Gaylord and Sault Ste. Marie, 2 inches.

Summary.

Temperature (in degrees Fahr.).—Monthly mean, 44.1; highest monthly mean, 48.7, at Grand Rapids; lowest monthly mean, 38.0, at Calumet; maximum, 83.0, at Corunna, on the 8th; minimum, 4.0, at Gaylord, on the 30th; range for state, 79.6; greatest local monthly range, 71, at Gaylord; least local monthly range, 47.0, at Calumet; greatest daily range, 46.0, at Evart, on the 16th; least daily range, 3.7, at Grand Haven, on the 1st.

Precipitation, including melted snow (in inches).—Average for the state, 3.16; greatest, 6.88, at Gaylord; least, 1.49, at Detroit.

Wind.—Prevailing direction, southwest.

The "Minnesota Weather Service," Prof. Wm. W. Payne, Carleton College, Northfield, director:

The month was characterized by a slight excess of precipitation over a small area in the northern portion of the state and a decided deficiency elsewhere. The first snow of the season was generally reported throughout the state during the month, and was quite heavy in some localities. The temperature was markedly below the normal, and during the passage of a severe cold wave on the 25th the minimum was below zero at some stations, this being the coldest weather experienced in October for many years. In some counties the ground was frozen to the depth of several inches and ploughing was interrupted.

Temperature.—The mean for the state is 40° 3; this is respectively 2° 4 and 11° 1 below that of the corresponding months of 1885 and 1886; and is about the lowest recorded since 1873, when it was about the same. The month was one of comparatively low temperature throughout, at stations where records have been kept for years the means are considerably below the normal.

Precipitation.—This has been very unevenly distributed; the least amounts having fallen in the extreme northwestern portion of the state, while the greatest were in the north-central and northeastern portions, or in the region of the Great Woods, where it was slightly above the normal. The average for the state was 1.52 (inches); this is 0.60 above that of the corresponding month of 1885 and 0.10 above that of 1886. Although the average is above that for the preceding two Octobers, yet at stations where the normal is obtained from the observations of a number of years there is a decided deficiency.

Wind.—The prevailing direction was from the northwest.

The "Missouri Weather Service," Prof. Francis E. Nipher, of Washington University, Saint Louis, director:

Temperature.—The average temperature for the state was 52° 9. The highest monthly mean was 57° 1, at Pro Tem, Taney Co., and the lowest monthly mean, 45° 6, at Ironton, Iron Co. The highest temperature reported was 95° 0, at Pro Tem, on the 6th, and the lowest temperature, 18° 0, at Ironton, Iron Co., and Fayette, Howard Co., on the 30th. The total range in temperature for the state was 77° 0; the greatest local monthly range was 73° 5, at Fayette, and the least local monthly range was 45° 0, at Savannah, Mo.

Rainfall (in inches).—The average rainfall for the state was 1.65. Greatest rainfall, 3.87, at Leavenworth, Kans.; least, 0.38, at Cairo, Ill.

The "New England Meteorological Society," Prof. Wm. H. Niles, of the Institute of Technology, Boston, Massachusetts, president:

Reports for the month were received from one hundred and forty-seven observers.

Atmospheric pressure (in inches).—Monthly mean, 30.00 (twenty-one stations); maximum observed, 30.53, at Nashua, on the 26th; minimum observed, 29.23, at Eastport on the 21st; range for New England, 1.35; greatest local monthly range, 1.32, at Portland; least local monthly range, 0.98, at Middletown.

Temperature (in degrees Fahr.).—Monthly mean, 48.2 (one hundred and eight stations); highest monthly mean, 54.6, at Nantucket; lowest monthly mean, 40.7, at Mayfield; maximum, 80, at Taunton, on the 10th, and Olneyville on the 8th and 10th; minimum, 12, at West Milan, on the 16th; range for New England, 68; greatest local monthly range, 64, at Lake Cochituate; least local monthly range, 28, at Nantucket; greatest daily range, 52, at Berlin Mills, on the 16th; least daily range, 1, at Manchester, Mass., on the 2d and 30th.

Precipitation, including melted snow (in inches).—Average for New England, 2.49 (one hundred and thirty-one stations); greatest, 4.56, at Long Plain; least, 1.21, at North Conway and Chelsea.

Wind.—Prevailing directions, west and northwest.

The "New Jersey Weather Service," Prof. George H. Cook, of the Agricultural College, New Brunswick, director:

Temperature (in degrees Fahr.).—Monthly mean, 52.3; highest monthly mean, 58.9, at Ocean City; lowest monthly mean, 46.5, at Rancocas; maximum, 89.0, at Clayton, on the 8th; minimum, 21.0, at Hanover, on the 31st; range for state, 68.0; greatest local monthly range, 68.2, at Egg Harbor City; least local monthly range, 3.8, at Ocean City; greatest daily range, 44.0, at Locktown, on the 18th; least daily range, 5, on the 28th.

Precipitation, including melted snow (in inches).—Average for the state, 2.61; greatest, 5.00, at Ocean City; least, 1.58, at Princeton.

Wind.—Prevailing direction, northwest.

Summary.

Mean temperature, 52° 3; highest temperature, 79° 0, on the 8th; lowest temperature, 27° 4, on the 31st; monthly range of temperature, 51° 6; greatest daily range of temperature, 31° 8, on the 16th; least daily range of temperature, 3° 7, on the 1st; mean daily range of temperature, 18° 2. Total precipitation, 2.68 inches. Number of days on which .01 or more of precipitation fell, 10; number of clear days, 8; number of fair days, 14; number of cloudy days, 9. Light frost, occurred on the 12th and 14th; killing frosts occurred on the 13th, 15th, 16th, 23d, 26th.

The "Ohio Meteorological Bureau," Prof. B. F. Thomas, of the Ohio State University, Columbus, president:

Atmospheric pressure (in inches).—The mean atmospheric pressure for the month was 30.08, which is 0.03 below the mean for the past five years. The

highest reading of the barometer reported was 30.52, at Wauseon, on the 25th, and the lowest, 29.56, at Jefferson, on the 4th. The monthly range was 0.96.

Temperature.—The mean temperature was 49° 3, which is 8° 1 below the five years' average, 3° below the normal for the month, and is the lowest for the month of October since the opening of the bureau. The highest temperature was 89° 8, at Logan, on the 7th, and the lowest, 11° 5, at Waverly, on the 31st. The monthly range was 78° 3, which is 9° 2 below the mean range for the past five years.

Precipitation (in inches).—The most noticeable feature of the weather was the unusually small rainfall. The mean for the state was 0.75; this is 1.62 below the five-year average, and is less than one-third the normal amount. General, though light, rains occurred throughout the state on the 3d, 9th, 10th, 11th, 23d, and 29th, and in the northern section on the 1st, 2d, 4th, 5th, 21st and 22d. The greatest rainfall reported was 3.55, at Jefferson, and the least, 0.11, at Springborough. The drought which began in June continued throughout October, and as a consequence many of the small streams and wells have dried up, and the rivers are very low, causing serious interruption to business, many furnaces being closed for want of water. The low stage of the water has also caused much sickness, typhoid fever being prevalent in many parts of the state.

Average number of clear days, 12.2; average number of fair days, 9.0; average number of cloudy days, 9.8; average number of days on which rain or snow fell, 3.7; least number of days on which rain fell, 1, at New Bremen; greatest number of days on which rain fell, 14, at Cleveland (Hyde); mean monthly rainfall, 0.75; average daily rainfall, 0.24.

Prevailing direction of the wind, southwest.

"Oregon Weather Service," report prepared by B. S. Pague, Private, Signal Corps:

A marked feature of the month has been the abnormally high temperature which continued until the 23d in the northern and central parts of the state, and along the coast, but on the date mentioned the temperature fell decidedly; the first killing frosts of the season being reported on the 23d and 24th; in the extreme southern and in the eastern portion the temperature continued high until the 15th, when killing frosts were reported from those regions, it was again high from the 17th to 23d. The maximum temperature occurred from the 3d to the 12th, the minimum on 23d and 24th. An unusually warm wave was felt at Bandon, on Coos Bay, on the 11th; it was very warm throughout the state on that day, but especially so there; the temperature rose to 86°, a very unusual feature. The observer reports an easterly wind; temperature of 58° at 6 a. m., 74° at 9 a. m., 86° at 12 m., and 62° at 6 p. m. The mean of the state is 51° 3.

Precipitation, (in inches).—The most marked feature of the month has been the great deficiency in the rainfall in all sections. A few showers occurred, the greatest number, 18, at Astoria; the least, 1, at Lakeview. The greatest deficiency occurred at Bandon, where it was 8.36; the least, 0.66, at Fort Klamath. For the season, from July 1st, the precipitation is below the average in all sections of the state.

The "Pennsylvania State Weather Service," report prepared under the direction of the Franklin Institute, Philadelphia, by Sergeant T. F. Townsend, Signal Corps, assistant:

The general climate of the state for October has been from 2° to 5° colder than usual, especially in the western and elevated counties. The cold of the 15th, 22d, 26th, and 31st was quite general, and nearly all the western and northern counties report snow on the 21st and 22d, in amounts from "ground covered" to one inch at Scranton and Wellsborough, and four inches at Greenville. Most vegetation was cut off throughout the state by the killing frost of September 26th, although in some of the eastern and southern counties, and in the lower valleys, the hardier sorts were continued until the severe frosts, which occurred during the latter half of October, and from which no district was free. An abundant growth of fall wheat and grass has been reported.

The colder belt of highlands had a mean of 45° at observing stations, and about 40° for the higher surfaces. The central counties had an average of 47° at observing stations, with a very considerable area of 60° in the valleys, and of 52° at West Chester, Swarthmore, Uniontown, Pottstown, and Carlisle, 53° at Pittsburg, and 55° 6 at Philadelphia, which is not a full degree below the average for a series of years. The mean at Erie was 48° 9, and therefore 4° 4 below the general mean of 53° 3.

The season at the lake shore was probably not so much extended as usual, owing to the severe frosts in September and October. None of these changes were either caused or attended by general storms of severity. The month was remarkably free from storms or floods, the rainfall being generally light. The southwestern part of the state is reported as very dry. In Westmoreland county the scarcity of water in wells and cisterns is causing much inconvenience. At several posts of observation, the rainfall was less than an inch, at Pittsburg, State College, Ridgway, McConnellsburg, Huntingdon, Indiana, Greenville, Washington, Greensburg, Catawissa, Charlesville, and Phillipsburg. Erie and Fallsington were exceptional, with 4.48 inches at Erie, and 3.06 at Fallsington. The number of rainy days varied from four to seventeen, the average for the state being seven. A severe wind storm from the southwest and west occurred at Greenburg, Greenville, Clarionville, Indiana, Meadville, and Scranton on the evening of the 23d. The general atmospheric movement for the month was rather less marked than usual, and no northeast storm occurred east of the Alleghenies, as often happens in October.

The "South Carolina Weather Service," Hon. A. P. Butler, Commissioner for South Carolina, director:

Temperature (in degrees Fahr.).—Monthly mean, 61.4; highest monthly mean, 66.3, at Yemassee; lowest monthly mean, 55.9, at Kirkwood; maximum, 91, at Spartanburg, on 11th; minimum, 30, at Chester, on the 31st; range for state, 61; greatest local monthly range, 66, at Chester, Kingstree, and Spartanburg; least local monthly range, 38, at Yemassee; greatest daily range, 41, at Yemassee, on the 7th; least daily range 3, on the 20th, at Beaver Mine.

Precipitation, including melted snow (in inches).—Average for the state, 5.96; greatest, 10.11, at Cheraw; least, 2.50, at Jacksonborough; average number of rainy days, 8.5.

Wind.—Prevailing direction, north.

The following is an extract from the report of the "Meteorological Department of the State (Tennessee) Board of Health," prepared under direction of J. D. Plunkett, M. D., President of the State Board of Health, by H. C. Bate, Signal Corps, Assistant, Nashville:

October was characterized by the large percentage of clear or fair weather and the almost total absence of electrical disturbances. The other features showed but slight departures from the normal. The cold wave which passed over the state on the 5thth resulted in a light frost in the eastern and middle divisions. Altogether, the month was a delightful one.

The mean temperature was 55° 9, slightly below the normal October mean of the past five years. The maximum temperature observed was 90°, recorded on the 10th, and was the highest October maximum during the five years, except in 1884, when it reached 99°. The minimum temperature was 22°, recorded on the 31st, and was, together with the October minimum in 1884, the lowest in the above corresponding period. The monthly range of temperature was the greatest October range during the above period, except in 1884. There were three cold-wave predictions during the month, viz., 4-5th, 24-25th, and 29-30th, all of which were fully verified.

The mean precipitation for the month was 2.57 slightly below the normal of past five years. Of this amount the eastern division received an average of three and a quarter inches, the middle division two and a half inches, and the western division, two inches. The greatest rainfall was 5.60 inches, reported at Fostoria, and the least was 1.22 inches, reported at Milan. The greatest rainfall in twenty-four consecutive hours was 3.80 inches, reported at Fostoria, on the 19th. The first half of the month was almost rainless, slight showers being reported on the 1st, 10th, and 11th. From the 17th to the 25th, inclusive, nearly all the rain of the month was received, the rains of the 17th, 24th, and 25th being general, the others mostly local, and generally light. The heaviest rain of the month fell on the 24th. About fifteen days were without measurable rainfall. Frosts were reported on about ten days, several of these, notably on the 12th, 13th, 22d, and 31st, were killing frosts, the others mostly light. Dews were reported on about eight days. On the 30th there was a very slight fall of snow in the eastern and middle divisions; the greatest amount fell at Greenville, but at most of the other stations it was scarcely noticeable.

Prevailing wind, north.

NOTES AND EXTRACTS.

DIRECTION OF MOVEMENT OF AREAS OF LOW PRESSURE.

[By 2d Lieut. F. M. M. BRALL, Signal Corps, Assistant.]

An examination of the prevailing meteorological conditions in the vicinity of low areas will develop certain characteristics usually found with all areas of low pressure, such as a general movement of the air in the vicinity around, and inclined towards the centre of the low area; the highest temperature in the east or south quadrants and the lowest in the west or north; the presence of cloud and rain in certain portions of the area and fair weather in others, etc.

Now, if these characteristics are uniform attendants upon areas of low pressure, it will be practically an easy matter, in studying the tri-daily charts of the Weather Bureau, to draw conclusions in reference to the probable weather conditions at some future period, provided we are able to correctly define the paths the low areas will pursue.

The several forces which seem to influence the direction of movement of low areas in the United States appear to be:

- (1.) The general drift of the atmosphere.
- (2.) Unequal results of centrifugal force on all sides of the area.
- (3.) Unequal condensation of vapor at all points within the area.
- (4.) Unequal temperature changes in the vicinity of the area.
- (5.) Unequal pressure changes in the vicinity of the area.
- (6.) Attraction by neighboring areas of high barometer.
- (7.) Unknown influences.

(1.) Over the region of the United States the general drift of the atmosphere is toward the east, and any abnormal disturbance prevailing within its limits will be affected by this motion and eventually conform to its direction, although superior forces may often cause a low area to temporarily take an opposite course.